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XXXIV.—*On a new Genus of Devonian Corals, with Descriptions of some Species of the same.* By H. ALLEYNE NICHOLSON, M.D., D.Sc., Regius Professor of Natural History in the University of Aberdeen; and ARTHUR H. FOORD, F.G.S., late of the Geological Survey of Canada.

[Plates XV. & XVI.]

THERE occur in the Devonian formation of both Germany and Britain certain types of Corals which have a close resemblance in general aspect to the species of the genus *Chætetes*, Fischer. In some regions, as in the Middle Devonian of the Rhine, these corals are sometimes very abundant. This is the case with the singular coral described by Prof. Ferd. Roemer under the name of *Chætetes stromatoporoides* (Leth. Palæoz. p. 459, fig. 111). An allied form has been described by Prof. Schlüter under the name of *Calamopora crinalis*. To the same group must also be referred the coral described from the Devonian rocks of Devonshire by Mr. Etheridge, Jun., and one of the present writers under the name of *Chætetes Lonsdalei*. Having recently had the opportunity of making a microscopical examination of a very extensive series of these forms, we have satisfied ourselves that they cannot be referred to the genus *Chætetes*, Fischer; and, indeed, that they exhibit characters which distinguish them from any clearly defined genus with which we are acquainted. We propose therefore to found for their reception the new genus *Rhaphidopora*, with the following characters:—

Genus Rhaphidopora, Nich. & Foord.

Corallum variously shaped, but mostly encrusting, or in other cases massive. Corallites all of one kind, polygonal, in close apposition, the walls of contiguous tubes being confluent. Walls of the corallites imperforate. Calices polygonal. Tabulæ numerous, horizontal. Septal spines variably developed, but always present, and consisting of conical tooth-like projections, which extend only a short distance into the visceral chambers of the corallites, and are not arranged in regular vertical rows. Increase by gemmation.

Type : *Rhaphidopora crinalis*, Schlüter, sp.

Rhaphidopora crinalis, Schlüter, sp.
(Pl. XV. figs. 1–3.)

Calamopora crinalis, Schlüter, Sitzungsberichte der niederrheinischen Gesellschaft in Bonn, 1881, p. 281.

Chætetes Lonsdalei, Eth., Jun.. & Foord, Ann. & Mag. Nat. Hist. 1884, vol. xiii. p. 474, pl. xvii. figs. 2–2 *c*.

Spec. char. Corallum sometimes encrusting, sometimes laminar, sometimes massive, the latter being probably the typical adult condition. Corallites polygonal, with completely coalescent walls, averaging about $\frac{1}{3}$ millim. in diameter, but with dimensions in some specimens slightly larger or smaller than this. Tabulæ are well developed, horizontal, and about $\frac{1}{3}$ to $\frac{1}{5}$ millim. apart. The walls of the tubes are not specially thickened, and often exhibit dark transverse lines, which seem to connect adjoining visceral chambers, and which look like mural pores filled up with some dark material. These cross bars will be subsequently shown, however, to be due to mineralization, and the walls are in reality imperforate. Septal spines are variably developed, but are present in all well-preserved examples, and have the form of strong tooth-like projections, which extend a short distance into the visceral chamber, and which, however numerous, are not arranged in regular vertical rows.

Obs. This species is very variable in its mode of growth, but its adult form seems to be usually that of a spheroidal or pyriform mass. We have examined a large series of specimens, most of which are from the Middle Devonian of Germany, and which, like most of the more delicate corals from this region, have undergone a good deal of change in the process of mineralization. Hence there are various points in the structure of the species which it is difficult to account for with absolute certainty. In tangential sections of *R. crinalis* Pl. XV. figs. 1, 2, and 3) the most striking feature is the

presence in the corallites of a variable number of strong tooth-like projections, which extend a short distance inwards into the visceral chamber. Sometimes there may be only one of such projections visible in a given corallite, or there may be several. When only a few of these structures are present they have a close general resemblance to the curious inward projections of the walls which characterize the genus *Chætetes*, Fischer. In the latter, however, these projections are undoubtedly the result of the fission of the tubes. On the other hand, in *R. crinalis* they are of a different nature, being incontestably of the character of septal spines. That this is their true nature is conclusively shown by the fact that they are not only, on the whole, far more numerous than are the apparently similar projections in *Chætetes*, but a single corallite may have four or five or more of such teeth exhibited in transverse section, a condition which would be impossible if they were due to fission of the tubes. These tooth-like projections, in fact, bear a marked resemblance to the peculiar septal spines of the so-called *Alveolites Battersbyi*, E. & H.

A more difficult point to be assured of is, as to whether or not mural pores are present in *R. crinalis*. This problem was decided in the affirmative by Prof. Schlüter, upon the ground that the walls of the corallites commonly exhibit dark transverse bars, as seen in tangential sections, and that such bars must be mural pores filled up with matrix. Similar transverse bars intersecting the walls of the corallites in tangential sections are seen in all the species of *Rhaphidopora* which have come under our notice, and they are sometimes very numerous and very regular in their distribution and arrangement. At first sight, they certainly present a resemblance to mural pores filled up by some dark material; but there are several reasons of a general nature from which it must be concluded that this cannot be their true constitution. Thus, it is incredible that these transverse markings should be so numerous as they often are in the species of *Rhaphidopora* if they are really due to mural pores; since in tangential sections of species of *Favosites*, *Alveolites*, and *Michelinia*, in which mural pores are well known to exist, it is a comparatively unusual thing to find them in transverse sections of the tubes. Again, it is in the highest degree improbable that these markings should be due to mural pores, and that no traces of the existence of such apertures should be capable of detection in *longitudinal* sections of the corallites of *Rhaphidopora crinalis*. We have, however, never succeeded in demonstrating their presence in vertical sections of this or of any other species of *Rhaphidopora*, and are satisfied that they do not exist.

We shall further be able to show, in dealing with *R. stromatoporoides*, that these transverse markings in the walls of the corallites are not of organic origin at all. Both transverse and longitudinal sections of *R. crinalis* show that the walls of the corallites are in no way specially thickened, and the visceral chambers remain therefore distinct. Tabulæ (Pl. XV. figs. 2 *a*, 3 *a*) are numerous, horizontal, and complete.

The nearest ally of *R. crinalis* is *R. stromatoporoides*, Roem., sp.; but the latter has on the average tubes of a decidedly smaller size (averaging from $\frac{1}{5}$ to $\frac{1}{4}$ millim. in diameter). At the same time it is to be noted that in neither of these species are the corallites of an invariable size, since examples of *R. crinalis* occur with tubes below the average size, while specimens of *R. stromatoporoides* are found with corallites of greater than the average dimensions. In such cases it is difficult to decide positively to which of the two species a given specimen belongs. As a rule, however, the corallites in *R. stromatoporoides* are not only decidedly smaller than they are in *R. crinalis*, but their walls are mostly thicker and their visceral cavities are more rounded, while peculiar rounded tubercular structures, the nature of which is not quite clear, are often developed at the angles of junction of contiguous corallites.

Formation and Locality. Common in the Middle Devonian of Sötenich and Gerolstein, in the Eifel. We have also found it at Büchel (in the Middle Devonian of the Paffrath district). Professor Schlüter's specimens were collected in the Middle Devonian rocks of the Hillesheim basin, in the Eifel. We have also examined specimens belonging to this form from the Middle Devonian of Devonshire (Teignmouth, Bishopsteignton, and Torquay).

Rhaphidopora crinalis, Schlüt., var. *aculeata*, Nich. & Foord. (Pl. XV. figs. 4–4 *b*.)

Corallum laminar and encrusting, the corallites of decidedly larger size than is usual in *R. crinalis*, and being also of a more compressed and elongated form. The tubes vary in diameter from about $\frac{2}{5}$ millim. to $\frac{1}{2}$ millim. The walls of the corallites are not thickened and are furnished with very numerous tooth-like septal spines, which project a short distance into the visceral chambers. No signs of mural pores can be detected unless the occasional occurrence of dark transverse bars crossing the walls of the corallites in tangential sections be taken as indications of the presence of such openings; but these, as in *R. crinalis*, must we think be

interpreted to be the result of mineralization. The tabulæ are numerous, complete, and about $\frac{1}{3}$ millim. apart.

This hardly seems to be more than a well-marked variety of *R. crinalis*, Schlüt. It is distinguished by the larger average size of its corallites and their more compressed form, and, above all, by the extraordinary development of the septal spines. These structures are not only exceedingly numerous (Pl. XV. fig. 4 *a*), but they can be readily recognized in longitudinal sections of the corallites as well as in tangential ones. In sections of the former kind (Pl. XV. fig. 4 *b*) they are shown as strong, upwardly-directed, tooth-like spines developed from the walls of the corallites, and their cut ends are also seen as dark circular spots (which must not be mistaken for mural pores) in the cavities of the tubes themselves.

Formation and Locality. Middle Devonian, Gees, near Gerolstein, in the Eifel.

Rhaphidopora stromatoporoides, Roemer, sp.
(Pl. XV. figs. 5–7 *a* and Pl. XVI. figs. 1–7.)

Chætetes stromatoporoides, Ferd. Roemer, Lethæa Palæozoica, p. 459, fig. 111 (1883).
Pachytheca stellimicans, Schlüter, Sitzungsberichte der niederrheinischen Gesellschaft in Bonn, 1885, p. 144.
Calamopora piliformis, Schlüter, *ibid.* p. 144 (footnote).

Spec. char. Corallum laminar, most commonly composed of successive colonies of varying thickness, and very often attached by the whole of the inferior surface to some foreign body. Corallites polygonal, in close contact, with coalescent walls, averaging from $\frac{1}{5}$ to $\frac{1}{4}$ millim. in diameter, but sometimes falling below or exceeding these dimensions either wholly or in part. Walls of the corallites moderately thickened, the primordial wall being occasionally visible as a thin dark line in the centre of the apparently single wall separating the visceral chambers of adjoining corallites (Pl. XVI. fig. 1 *b*, upper part). The visceral chambers of the corallites may be filled with clear crystalline calcite (as usual), with the tabulæ intact; but in many cases they are more or less extensively encroached upon by a darker matrix, and the walls and the tabulæ obliterated by the development of a peculiar structure, which we shall subsequently show to be of a purely inorganic nature. At the angles of adjacent corallites are often developed peculiar tubercular thickenings, the nature of which is not apparent. Tabulæ are numerous and horizontal, mostly from $\frac{1}{8}$ to $\frac{1}{6}$ millim. apart. Septal spines are variably developed, but usually less numerous than in *R. crinalis*. Walls imperforate.

Obs. As regards the mode of growth in this form, the corallum not unfrequently consists of a single layer of corallites, perhaps ½ to 1 centim. in thickness, and forming an expansion of some inches across. In such a case the corallum may have a basal epitheca or it may be cemented down to some foreign body*. In a great many examples the corallum consists of a number of successively superposed layers or colonies, which may be all alike or which may differ from one another in certain apparently structural features. Sometimes these successive layers are obviously only the result of progressive interruptions in the growth of a single corallum, just as is seen in many other corals. In other cases the successive layers are separated by a complete interruption of continuity, a minute interval, represented by a delicate layer of mineral matter, existing between each pair of contiguous corallites. In such cases, provided the successive layers are all alike in structure, we see no reason to doubt that they belong to a single species and are the result of the growth of a number of successive generations one above the other. Precisely the same phenomenon is to be seen in many Stromatoporoids, in which the cœnosteum consists of a number of "latilaminæ," which may be separated from one another in places by more or less complete breaks or intervals.

In other specimens the fossil not only consists of a number of superimposed layers or colonies, but one or more of these layers may present appearances very different from the rest, the nature of which will be subsequently explained. In such cases it is natural to suppose that the differing layers belong to different *species*. Thus it is very common to meet with specimens composed of one or more layers of corallites which are distinguished by having their visceral chambers occupied by clear calcite and their walls and tabulæ distinct, together with one or more layers in which the visceral chambers are more or less completely obliterated by the removal of the tabulæ and the walls undiscernible.

Professor Schlüter has regarded such cases as the result of the parasitism of one species upon another distinct species. Hence he has called the layers with normal corallites and visceral chambers *Calamopora piliformis*, and he has given the title of *Pachytheca stellimicans* to the layers in which the corallites have their walls and visceral chambers more or less extensively effaced in a manner to be subsequently described and explained.

The observations we have made upon a very extensive

* It occurs very commonly growing upon the laminar cœnosteum of *Stromatoporella eifeliensis*, Nich.

series of such specimens as those above mentioned have led us to the conclusion that they consist, as a general rule at any rate, of two or more colonies of a single *species* in different states of preservation.

The principal grounds of a general nature upon which we base this conclusion are as follows :—

(1) Very many specimens are composed of successive layers, which may or may not be separated by complete interruptions of their continuity, but which must belong to a single species, as being throughout identical in structure.

(2) When successive colonies differ in apparent structure, they for the most part agree nevertheless in the size of the corallites, and they only differ as to the extent to which the walls and visceral cavities of the corallites have been obliterated by the induction of a peculiar secondary alteration, which we shall show to be due to mineralization.

(3) In the few instances in which the tubes in successive colonies not only differ in apparent structure, but also in size, the latter difference is not greater than often obtains in different parts of a single layer, or of successive layers which otherwise agree in every respect.

(4) In these composite specimens the different layers are all precisely conterminous, each being applied to the entire surface of the layer below. If, however, we were dealing with a case of the parasitism of one species upon another, we could not fail to meet with specimens in which the parasite would only *partially* envelop the organism upon which it grew.

We consider then that the differences in apparent structure above alluded to constitute an *individual* and not a *specific* character, and we shall consider the nature of this character immediately. Before doing so, however, it is advisable to make some remarks upon the size of the tubes in the present species. The diameter of the corallites is a point to which Schlüter assigns a specific value, and upon which he lays considerable stress. Thus he assigns 20–22 tubes in a square millimetre to *Calamopora piliformis*, Schlüt., this corresponding roughly with a diameter of between $\frac{1}{4}$ and $\frac{1}{5}$ millim. to the individual corallites. *Calamopora stromatoporoides*, Roem., is said to have 30–40 tubes in a square millim., which would give a rough average of from rather less than $\frac{1}{5}$ to rather more than $\frac{1}{6}$ millim. *Calamopora crinalis*, Schlüt., is stated to have 14 tubes to the square millim., which would give a diameter of rather less than $\frac{1}{3}$ millim. to the individual corallites. Lastly, *Pachytheca stellimicans*, Schlüt., is stated to have 12–15 tubes to the square millim., or a diameter of between $\frac{1}{3}$ and $\frac{1}{4}$ millim. to each tube.

Our observations have extended over a very large series of specimens, and have led us to conclude that the size of the tubes is an exceedingly variable character. That the tubes of *R. stromatoporoides*, Roem., are on an average decidedly smaller than those of *R. crinalis*, Schlüt., is undeniable; and hence this character is one very serviceable in the discrimination of specimens of these two forms. On the other hand, there are individual specimens, not otherwise separable from the type of *R. crinalis*, which have tubes considerably smaller or larger than the average of the species. In the same way there are individuals of *R. stromatoporoides*, Roem., with tubes decidedly larger than is usual in the species, while others have tubes below the ordinary standard of width. Hence there are specimens which it is difficult to definitely refer to either the one species or the other. Moreover, we find that the size of the corallites is not necessarily or always constant even in a single individual. In the case of *R. stromatoporoides*, in particular, we find that a single specimen, or even a single slide, may show in different parts precisely the same variations in the sizes of the tubes which Professor Schlüter relies upon for separating his *Calamopora piliformis* from *R. stromatoporoides*, Roem. We are therefore of opinion that, except within certain restricted limits, the dimensions of the corallites in these corals cannot be safely trusted to as a means of discriminating species.

The most interesting feature in connexion with *R. stromatoporoides*, Roem., is, however, the extraordinary variations exhibited by different individuals of the species as to the condition of the visceral cavities and walls of the corallites. These variations form a connected series, of which the following are the two extreme terms :—

(A.) In one set of specimens the visceral chambers of the corallites are filled only with clear calcite, and the walls of the tubes remain perfectly distinct. Such specimens also have the tabulæ and septal spines well developed (Pl. XV. figs. 5–5 *b*, 6, 6 *a*, 7, 7 *a*). These examples closely resemble *R. crinalis*, Schlüt., in their main structural features; but their tubes are on the average decidedly smaller than those of the latter species. Thus the corallites of *R. crinalis* have an average diameter of $\frac{1}{3}$ millim., whereas the corallites of the forms here under consideration are between $\frac{1}{4}$ and $\frac{1}{5}$ millim. in diameter.

Judging from the short description given, we should say that it is upon specimens of this group that Professor Schlüter has based his *Calamopora piliformis* (*loc. cit. suprà*), and we may therefore provisionally speak of such as "*piliformis*"

specimens. Sometimes the entire specimen may be in the above condition, and may consist of several superposed colonies; in other cases the specimen may consist of one (sometimes more than one) colony in this condition, and of one or more colonies in the following state.

(B.) In a second group of specimens the axes of the visceral chambers are represented by dark lines, from which proceed slender also dark radii, the walls of the corallites being at the same time more or less completely obliterated, the septal spines being no longer recognizable, and the tabulæ having almost or quite disappeared. Specimens in this condition can be readily recognized by the possession of a characteristic dark-brown or black colour on broken surfaces, together with the possession of a crystalline texture and an almost conchoidal fracture.

Tangential sections of such examples (Pl. XVI. fig. 2) show appearances which are at first sight very similar to what is seen in corresponding sections of Stromatoporoids belonging to the genus *Actinostroma*, Nich. The general ground-mass of the section is, however, composed of a translucent structureless or obscurely fibrous horn-like material, of a brown colour, not clearly exhibiting the walls of the corallites, and showing no light spaces filled with calcite, such as would represent the cavities of the tubes. The section, on the other hand, exhibits a number of dark stars, usually with six rays each, and these stars become united regularly by the union of their rays, so as to give rise to a kind of "hexactinellid" structure. The centre of each of these dark stars represents, as will be seen, the centre of a visceral chamber, and each star therefore corresponds with a single corallite.

Vertical sections of specimens belonging to the group now under consideration present the same translucent, horn-like, brown aspect (Pl. XVI. fig. 1 *c*, or the upper half of fig. 6). The most conspicuous feature in such sections is the presence of parallel vertical dark lines, which *look* like the walls of the corallites, but which really represent the axes of the visceral chambers. Midway between each pair of these dark lines we may often recognize much fainter lines, which indicate the position of the true *walls* of the corallites. The entire ground-mass of the section has more or less conspicuously a characteristic fibrous or semicrystalline aspect; and we may here and there recognize the position of one of the tabulæ (Pl. XVI. fig. 1 *c*, *t*).

The appearances just described were regarded by Professor Schlüter as being of an organic nature, and he hence referred the group of specimens here in question to a new genus and

species under the name of *Pachytheca stellimicans* (Sitzungsberichte der niederrhein. Gesellsch. in Bonn, 1885). Even on the supposition that these appearances *are* organic, we should be unable to accept this name, either as regards the species or the genus, since it can be shown conclusively that the *species* is the *Chætetes stromatoporoides* of Roemer *, while the name of *Pachytheca* has been preoccupied by Sir Joseph Hooker for certain problematical bodies from the Ludlow rocks of Britain †.

EXPLANATION OF THE PLATES.

Plate XV.

Fig. 1. Tangential section of *Rhaphidopora crinalis*, Schlüter, enlarged twelve times. The section is taken from the type-specimen of *Chætetes Lonsdalei*, Eth., Jun., & Foord, and is from the Devonian of Teignmouth.

Fig. 1 *a*. Vertical section of the same, similarly enlarged.

Fig. 2. Tangential section of a specimen of *Rhaphidopora crinalis*, Schlüt., from the Middle Devonian of Sötenich, in the Eifel, enlarged twelve times. The tubes are somewhat larger than in the typical examples of *R. crinalis*; but this would not appear to be a difference of specific value.

Fig. 2 *a*. Vertical section of the same, similarly enlarged.

Fig. 3. Tangential section of a specimen of *Rhaphidopora crinalis*, Schlüt., from Gerolstein, in the Eifel, enlarged twelve times. In this specimen, as in the preceding, the tubes are somewhat larger than in typical examples of the species.

Fig. 3 *a*. Vertical section of the same, similarly enlarged.

Fig. 4. Tangential section of *Rhaphidopora crinalis*, Schlüt., var. *aculeata*, Nich. & Foord, enlarged twelve times. Middle Devonian, Gerolstein.

Fig. 4 *a*. Part of the same section, enlarged twenty-four times. The dark transverse bars visible here and there, crossing the walls of the tubes in tangential sections, are not due to the presence of mural pores, but seem to be the result of mineralization.

Fig. 4 *b*. Vertical section of the same, enlarged twenty-four times. *s*, the cut extremity of one of the septal spines.

Fig. 5. Tangential section of a specimen of *R. stromatoporoides*, Roem., in which the visceral chambers are open and the walls distinct, enlarged twelve times. Middle Devonian, Gerolstein.

Fig. 5 *a*. Part of the same section, enlarged twenty-four times, showing the septal spines.

Fig. 5 *b*. Vertical section of the same specimen, enlarged twelve times. In the upper portion of the section destructive infiltration has set in, and the visceral chambers are partially obliterated.

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* We have examined an example of *R. stromatoporoides* kindly sent us by Professor Roemer himself.

† Quart. Journ. Geol. Soc. vol. ix. p. 12 (1853); *ibid.* vol. xvii. p. 162 (1861).

Fig. 6. Tangential section of an example of *R. stromatoporoides*, Roem., in which the visceral chambers and walls are nearly normal, enlarged twelve times. The tubes are slightly below the average size. Middle Devonian, Teignmouth.

Fig. 6 *a*. Vertical section of the same, similarly enlarged.

Fig. 7. Tangential section of a specimen of *R. stromatoporoides*, Roem., in the normal condition, the tubes being of slightly larger than average size, enlarged twelve times. Middle Devonian, Gerolstein.

Fig. 7 *a*. Part of the same section, enlarged twenty times, and showing the walls in a mineralized condition.

Plate XVI.

Fig. 1. Tangential section of *R. stromatoporoides*, Roem., taken close to the surface of the specimen, enlarged twelve times. In part of the section figured the visceral cavities are filled with the matrix, but in parts stellate crystallization has taken place, and the walls and visceral chambers are largely obliterated.

Fig. 1 *a*. Part of a tangential section of the same specimen, enlarged twelve times. Owing to infiltration and crystallization the walls of the tubes appear thickened and the visceral chambers are partially obliterated. Curious rounded tubercles are also seen at the angles of junction of the corallites.

Fig. 1 *b*. Part of another slide of the same specimen, enlarged twenty times. The tubes are partly filled with matrix and show distinct walls (sometimes with traces of the primordial wall). In other parts of the section the tube-cavities and walls are largely obliterated by stellate crystallization.

Fig. 1 *c*. Vertical section of the same specimen, enlarged twelve times. The dark vertical lines (*v*) represent the axial lines of the tube-cavities; but in places portions of the visceral chambers are not infiltrated with the darker destructive material, and still exhibit tabulæ (*t*).

Fig. 2. Tangential section of *R. stromatoporoides*, Roem., in the typical "*stellimicans*" state, enlarged twelve times. The visceral chambers and walls are completely obliterated by stellate crystallization. Middle Devonian, Gerolstein.

Fig. 2 *a*. Part of another tangential section of the same specimen, enlarged twenty times. In this part of the section the tubes are much below the average size. On the right hand side of the figure the stellate crystallization is completely developed; but towards the left the visceral chambers are not infiltrated with the darker material. The walls are obliterated throughout.

Fig. 3. Part of a tangential section of *R. stromatoporoides*, Roem., enlarged twenty times. The walls of the corallites are still quite recognizable, but the visceral chambers are occupied by stellate crystallization, the fibres of which strike through the walls and give to the latter the aspect of being crossed by transverse dark bars. Middle Devonian, Gerolstein.

Fig. 4. Vertical section of a double colony of *R. stromatoporoides*, Roem., enlarged twelve times. The lower colony (A) is in the normal state; the upper colony (B) is in the "*stellimicans*" state; and the two are separated by a well-marked interval. In the upper colony the axes of the visceral cavities are marked by vertical dark lines (*v*), and the fainter lines (*w*) between each pair of

these indicate the position of the true tube-walls. Middle Devonian, Gerolstein.

Fig. 5. Part of a tangential section of *R. stromatoporoides*, Roem., enlarged twenty times. The specimen is in the "*stellimicans*" state, but the walls of the tubes are visible. The peculiar rounded tubercles at the angles of junction of the corallites are well seen. Middle Devonian, Gerolstein.

Fig. 6. Part of a vertical section of a double colony of *R. stromatoporoides*, Roem., partly in the normal condition and partly in the "*stellimicans*" state, enlarged twelve times. Middle Devonian, Gerolstein.

Fig. 7. Part of a vertical section of another example of the same, similarly enlarged. In this specimen the stellate crystallization has not been complete, and the centres of the tube-cavities are partially unobliterated and exhibit the remains of the tabulæ. Middle Devonian, Gerolstein.

Fig. 8. Part of the surface of *R. stromatoporoides*, enlarged forty times. Minute elevations are seen at the angles of junction of the corallites; but these may be only the result of weathering. Middle Devonian, Gerolstein.

[To be continued.]

XXXV.—*Note on* Orcynus thynnus (*L.*).

By Francis Day, F.L.S., F.Z.S.

It is always satisfactory to obtain reliable records of rare or little-known British fishes, especially when new facts have been ascertained as to their geographical distribution, external form or internal structure, &c.; and I was therefore pleased to see in your last month's issue a paper by Dr. M'Intosh on a male tunny (*Orcynus thynnus*), 9 feet long, trawled off Pittenweem, in Scotland. In that paper some criticisms are offered upon my work on 'British and Irish Fishes' and on my figure of the tunny, which observations I propose briefly replying to so far as they affect myself.

But I must first observe that as no figure of this new specimen is given, while the number of fin-rays is omitted, no evidence is offered, except as to the size of the fish, that it was the tunny (*Orcynus thynnus*), or the bonito (*Thynnus pelamys*), or even *T. thunnina*, which has been captured more than once off Denmark. An essential difference between the fishes forming the restricted genera *Orcynus* and *Thynnus* consists in those pertaining to the first having "small teeth on the jaws, *vomer*, and palatine bones," while in the second there are "small teeth on the jaws, palatine bones, but *none on the vomer*." Dr. M'Intosh observes of his example:—"The